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ENVIRONMENTAL CONCERNS OF THE JOINT TASK FORCE COMMANDER

by

Robert B. Asmus
Lcdr. USN

A paper submitted to the Facility of the Naval War College in partial satisfaction of the requirements of the Department of Operations.

The contents of this paper reflect my own personal views and are *not necessarily* endorsed by the Naval War College or the Department of the Navy.

Signature R. B. Asmus

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Paper directed by Captain H. Ward Clark
Chairman, Department of Operations
Cdr. Robert W. Booker, Chair of Oceanography

Approved by
R. W. Booker
Facility Research Adviser

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Conflicts of the future will most likely involve low intensity clashes instead of major conventional warfare. Commanders must be prepared to execute the necessary shift in operational focus.

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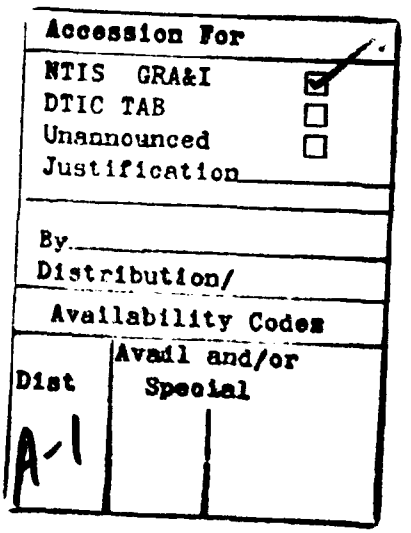
PREFACE

The environment is defined as an "aggregate of surrounding things, conditions, or influences."[1] The military concept of the environment is often interpreted as geophysical factors, terrain and weather, and geography and climate. In addition to focusing on traditional interpretations, the author expands the bounds of "environment" to include related political and economic factors which affect operations.

The full spectrum of concerns that Joint Task Force commanders must address is beyond the scope of this assignment. Recognizing the need to limit content, the author has chosen those subjects he considers most pertinent.

The goal of this paper is to identify and analyze the most critical environmental problems the Joint Task Force commander faces and to offer solutions to them. The intent is not to develop a checklist or formulate theory. The aim is directed at the operational level where strategy and tactics are integrated to win wars.



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CHAPTER I

INTRODUCTION

The environment is a factor Joint Task Force (JTF) commanders must consider in order to accomplish quick, clean, surgical victories with minimum post war repercussions. The key to combat success is identification of weakness and exploitation of advantage. Prudent leaders will utilize environmental knowledge to develop comprehensive battle plans and to tailor resources. Military leaders at every level must exhibit flexibility in dealing with the dynamic nature of the environment. "History condemns those who devote all their efforts to their primary goals without having concerned themselves with external influence."[2]

Changing geo-political and economic factors portend future conflict in third world areas, leading to low intensity involvement for United States' forces. Standing or ad hoc JTFs will most likely be the units dedicated to contingency response. Rapid deployment of forces to adverse and unfamiliar environments presents unique challenges to leaders and staffs. The environment favors the armed force which is capable of operating in adverse conditions without interruption to tempo.

Fortunately, today's technology allows the JTF commander unparalleled access to environmental prediction. Through

analysis, the commander can reduce uncertainty and plan around expected environmental constraints. As an alternative, "the relevance of the environment may be mitigated by reducing dependency on it."[3]

A commander once contended neutrality of the elements. General Eisenhower countered this argument by saying: "Nothing could be more untrue. Bad weather is obviously the enemy of the side that seeks to launch projects requiring good weather, or of the side possessing great assets, such as strong air forces, which depend on good weather for effective operations."[4] Discredited to a certain degree by technology, this statement remains salient. The environment is the ally of the force most capable of exploiting it.

Chapter II

HIGH TECH HOLES

JTF commanders must exercise caution with regard to dependency on high tech devices. There is little doubt that these devices are force multipliers of the highest magnitude and will make future battles quicker and less destructive. However, part of the anxiety surrounding these devices stems from the tendency toward total dependency on them and the inability to perform basic functions in their absence.

WEAPON SYSTEM DEGRADATION

Vice Admiral Mack suggests that "...wars of the future will be fought in the early stages by electronics."[5] High tech

devices are extremely important to an all weather operation, but the prudent commander should remain cautious of overestimating their capabilities. Warfare equipment capabilities hinge on the accurate determination of atmospheric conditions. Task Group commanders must anticipate the effects of the environment on the performance of weapon systems.

The performance of some weapons systems will rapidly degrade as various particulate are gathered into the atmosphere. Twenty-six atmospheric variables degrade weapons which use image intensifiers, thermal sights, laser target designators, or passive seekers in smart guidance systems.[6] Frequencies can be blocked or significantly degraded when fog, rain, snow, or clouds block the path to the target. Infrared systems and LASERS are highly vulnerable to particle contaminants.

Although Desert Storm provided the opportunity to test or verify the accuracy and agility of many weapons, the environment was relatively benign. A false confidence may exist in weapons that operated superbly in Desert Storm but may fail miserably in a more challenging climate.

The development of a Naval Warfare Environmental Sensitivity Index and the deployment of the Integrated Meteorological System (IMETS) has eased high tech tension and led to a rewrite of attack criteria. These systems are user friendly and provide means to disseminate complicated environmental data down to the lowest echelons.

The best method to anticipate weapon system degradation is through field testing. Although this is a costly and timely process, it is essential that the JTF commander be aware of equipment limitations.

DARKNESS

The armies of the past feared the night for many reasons. Some believed in ghosts, while others simply found it impractical to fight in the dark. Technology has reduced this impracticality, and today warriors are skilled in nocturnal operations.

"In the coming decades the increasingly widespread use of both active and passive night vision devices will greatly reduce the traditional usefulness of night for concealment purposes and rest."[7] Night Vision Devices (NVDs) or Night Vision Goggles (NVGs) allow the JTF commander the capability of fighting twenty-four hours per day on land, at sea, or in the air. This capability is particularly effective against a "low tech enemy," which may be found in third world countries, or during the execution of Non-Combatant Evacuation Operations (NEO).

The ability to extend the fight around the clock must be tempered by several concerns. Environmental factors, such as poor weather conditions, can reduce the effectiveness of NVDs. NVDs cannot operate effectively during the periods of dawn, dusk, and twilight due to rapidly changing ambient light. Vulnerability during these periods extends beyond optical

considerations. Atmospheric properties rapidly change from super-refractive to sub-refractive as surface terrain gains heat.

When assessing the feasibility of around the clock operations, commanders must remember that soldiers are not capable of operating effectively for long periods of time without sleep. As an additional consideration, if equipment is operated around the clock, the operating life will expire more rapidly.

The most prudent means of anticipating these problems is via the experience gained during night training. "Self sufficiency and confidence are key factors in developing a unit's capability for night operations. Emphasis should be placed on producing maximum operational effectiveness, and objectives should be limited."[8]

Darkness is a major force multiplier for commanders if used wisely and without the redundancy which might allow the enemy to extrapolate and exploit a routine.

BATTLE DAMAGE REPAIR

Modern technology has provided the armed forces with capabilities only dreamed of in the past. However, increases in capabilities generally go hand in hand with increases in complexity and sensitivity. As equipment becomes more sophisticated "...it will be more difficult to operate, less reliable, harder to repair, and there will be fewer replacement items because each will cost more, and therefore fewer will be purchased."[9]

The services have recognized that the advanced skill levels required to deal with high tech devices dictate that the operation and maintenance functions be performed by separate personnel. JTF commanders must recognize that often they go to battle with as many "fixers" as "fighters." Operational commanders must ensure they deploy a proportionate number of both assets. During combat operations, commanders must establish timely, logical, and efficient infrastructures to marry the operators and the technicians.

Environmental factors will be the leading cause of unscheduled maintenance. Repair efforts will be complicated by the fact that epoxies, glues, and composite material repair, require specific temperature conditions in order to properly dry. Foul weather clothing and chemical exposure suits can decrease dexterity and increase repair time.

Fiscal and strategic lift constraints aggravate maintenance problems by providing fewer spares. Desert Shield allowed time and storage space for significant stockpiling. Future adversaries will likely deny JTF commanders this option. Lack of spares drives an increased need for repair. Commanders will be prudent to allow significant periods of time for repair when planning an operation in an adverse environment.

This requirement cannot be overstated when planning coordinated operations which require precise timing. Maintenance delays will cause delays in rendezvous and missed deadlines. The "Desert One" abort is the perfect example. Sand and dust caused

helicopter malfunctions and forced air crews to miss important time marks. Additionally, blowing dust was a primary cause for the demise of the operation. Critical operations will require more backups, and these idle backup assets will degrade readiness.

Repair plans utilizing modular piece parts are essential to exploit the high tech environment. Long range planning must include building environmental packup kits designed to support short notice deployments.

Training technicians and debugging equipment is essential to climatological diversity. Soldiers must experience what it is like to perform maintenance in arctic, jungle, desert, and urban environments before the fighting begins. The Royal Marine's good fortune of conducting exercises in Norway prior to entry in the Falkland's War aided greatly in their acclimatization. Realistically, JTF commanders need more control over force training. Joint exercises in adverse environments should be made a priority.

FRATRICIDE

Fratricide is a new buzz word for an old problem. As weapons become faster and more lethal, they become less forgiving. Accidental destruction of U.S. or allied forces has a deep psychological impact. Environmental factors are a major contributor to blue on blue engagement.

Clausewitz espouses that war is an extension of politics. Today that axiom should be expanded to read that war is an

extension of politics and public opinion. Since the Vietnam conflict, politicians, commanders, and even basic infantrymen have become extremely concerned with public perceptions and yearn for public support during execution of operations. Few factors can adversely affect public support or damage momentum as quickly as fratricide.

While classified as "for official use only" information in the past, incidents of fratricide are highly publicized today. During Desert Storm, "Sixteen ground-to-ground engagements resulted in twenty-four service members being killed and fifty-seven wounded. Many of the incidents occurred at long ranges at night or during periods of reduced visibility when gunners were using thermal imaging sights."[10]

Two common factors exist among fratricide incidents in Desert Storm: all involved high tech weapons, and all were affected by environmental factors. The ability to operate in adverse conditions exceeds the ability to identify the enemy. In addition, environmental effects on communications can hinder command and control systems. "With reduced radio contact, and larger and wider battlefields, there is a greater likelihood that troops will be hit by friendly fire, since artillery will not have completely accurate information about the location of our troops."[11]

During Desert Storm, zero air-on-air fratricide incidents were reported. This success may be attributed to Identify Friend or Foe (IFF) systems and preplanned arrival gates. "In the future

Army units will be provided with infra-red automatic target recognition systems."[12] These are ground based IFF units. Other remedies include synthetic aperture radar, which will aide the seaborne forces. Submarine and anti-submarine warfare (ASW) forces are continuing to refine acoustic signature equipment to verify enemy forces.

SATELLITES

One fear most commanders have is the denial of a system or sensor which they planned and trained to use and hence came to depend on. Satellites are a prime example of such systems. JTF commanders rely heavily on satellites for weather observation, intelligence gathering, communication links, targeting information, and cartography. U.S. commanders in Vietnam were the first to benefit from these space assets and to realize the higher level of environmental support they afforded.

Commanders must consider that satellites could be quickly denied as a force multiplier. Although the Soviet anti-satellite threat continues to decrease, even a simplistic enemy can deny space assets use by destruction of terrestrial receivers. Old fashioned skills will be quickly called upon to fill this technology hole. Virtually every mission that receives information from satellites can be performed by terrestrial means, albeit not as timely or accurately. Meteorologists who are denied essential information for extended forecast, can develop predictions based on local conditions and past experience.

In the absence of satellite communication, the terrestrial communication channels will rapidly become overloaded. The forecaster may be denied access to super computers and atmospheric models. Operational commanders must ensure that space dependent systems and products are backed up by more conventional means.

Even if the enemy has the technical means, he may choose not to disable U.S. satellites. In this case the commander should assume that the enemy has acquired compatible receivers and is exploiting United States' data to his favor. "Until systems such as GPS are made secure it can be assumed the belligerent is privy to our data as illustrated in Desert Storm by Iraqi troops use of GPS."[13] Outstanding potential exists in this area for the JTF commander to conduct deception operations. In the future, more secure transmitters will be required to prevent satellite data piracy. Most U.S. satellites are currently oriented to operate in the northern hemisphere. Space assets will be inadequate to support future conflicts south of the equator unless solutions are sought well in advance. Look angles require adjustment to afford maximum coverage in the higher latitudes of both hemispheres.

CHAPTER III

ENVIRONMENTAL READINESS

With the fall of the Soviet Union, the United States has shifted the focus of national defense strategy from a nuclear or

major conventional war to low intensity conflict. The services must recognize this shift and reorient training. Doctrine must be adopted to deal with small coastal states with limited infrastructures and less developed societies. In many cases U.S. forces have visited these environments in the past. Now is the time to review the knowledge gained during these visits and incorporate it into contingency plans for third world environments.

MEDICAL

It has been said that if one wants to see into the future one needs only to read history. JTF commanders would be prudent to direct medical staffs to do just that. Malaria killed as many men at Guadalcanal as bullets did. This and many other diseases remain active in remote areas of the world to which the JTF commander may deploy. Scientists have developed an oral vaccination to combat malaria; however, treatment can affect force readiness. Pilots may be grounded due to side effects like vertigo. The anticipation of third world low intensity conflicts should signal JTF commanders to focus on medical lessons learned.

"Many commanders have not been taught and do not practice the art of managing their human resources in adverse climates."[14] The key to success is acclimatization. There is a tendency to let the "doc" handle this problem. The experienced commander will realize that physiological adaptation takes time, and his is job to provide the time if possible. Most Desert Storm troops were in theater for at least ten days before the

fighting began. Future conflict may develop rapidly and time will be sacred. Rapid air transport may force a soldier into a drastically different climate within a matter of hours. In such cases the JTF commander must ensure that particular attention is paid to diet, physical fitness, and hydration.

SHALLOW WATER OPERATIONS

There is no doubt the U.S. Navy owns the blue waters of the world. The brown waters are the threat U.S. forces are not well prepared to deal with. Riverain warfare, diesel-electric submarines, and high speed missile shooting coastal craft, warrant immediate attention since these will be the primary threats in conflicts involving small third world countries.

Riverain warfare is a specialty which must be revitalized in order to effectively deal with third world forces. Rivers and bayous will offer sanctuary for small craft adept in this environment. Special forces are required to counter this threat, and JTF commanders must incorporate these forces into their planning and deployment.

Diesel-electric submarines are extremely effective in a coastal environment. What they lack in speed they make up for in stealth. Primarily torpedo shooters, they will prey on merchants and less capable naval vessels, particularly at choke points where ships are channelized. The collapse of the Soviet Union has enabled many small coastal states to acquire Foxtrot submarines. Due to their quiet nature, diesel submarines cannot be prosecuted with the passive acoustic sensors currently used by

the U.S Navy. With the introduction of this threat, ASW tactics must shift from passive to active prosecution.

High speed missile shooting coastal craft can be lethal to ships if they are allowed to shoot first. The Persian Gulf conflict offers an excellent example of this threat. The small craft are too maneuverable for the tactical jet to easily hit with the current inventory of weapons it carries. In Desert Shield army helicopters were deployed on navy ships to counter these boats, because the U.S. Navy has no operational helicopters with missile systems installed. The army helicopters were very effective but were incapable of many other critical maritime jobs, such as ASW. This is unsatisfactory, since inexpensive off-the-shelf systems exist which are compatible with naval airframes. Future operations will require that navy helicopters are armed and ready to defend against small boat attacks in coastal areas.

TERRAIN

"The goal of topographic operations is to ensure that timely, accurate, and sufficient knowledge of the battlefield terrain is provided to each commander throughout all phases of combat operations."[15] Terrain analysis is fundamental to planning, and many conclusions are derived from charts, maps, and overlays.

JTF commanders are exposed to vulnerabilities in this area. Increasingly complex weapons systems require more stringent data, resolution, and accuracy than the mapping system can keep up

with. In 1982 the increased employment of computer driven weapon systems generated special requirements, so automated mapping and charting systems were developed. These systems provided the necessary interfacing of digital data to electronic display equipment.

The second problem the JTF commander faces in this area is the interoperability of charts and maps. Grids must be standardized with geographic references common to all users. "The Joint Requirements Oversight Council of the Department of Defense is working on this problem and developing Military Standards and Military Specifications to fix it."[18] In the short term it will be the responsibility of the JTF commander to ensure that all units within his command are operating with compatible charts and maps.

The Defense Mapping Agency is currently pursuing a variety of data storage media in digital form. A single compact disc can store the equivalent of 22 square feet of maps. Another single disc may be used to hold more than 200 cells of digital terrain elevation data. This can eliminate the need to transport and store 20 nine-track magnetic tapes. These space saving devices have significant advantages aboard ships and for other units requiring a large volume of terrain data.

In a rapid deployment situation a commander must focus on securing the necessary equipment and environmental support products to do the job. "Terrain analysts are responsible for analyzing the effect of weather on the terrain and the resulting

systems that can be effected."[17] The most general restriction weather and terrain place on forces is a reduction in mobility and sustainability. Torrential rains can slow movement and stymie supply channels. A New York Times reporter quoted an unidentified French military authority who, when asked why the Allies did not rush ahead and crush the Germans, said: "There's one Generalissimo whom all belligerents take orders from, General Mud."[18] Operations suffer from mud today much the same as in World War I.

Predictions must be tailored to account for atmospheric anomalies, and weather models should be used as tools vice disciplines. During Desert Storm, coalition planners assumed the customary 13% cloud cover, which is typical for the region at that time of year. The cloud cover actually measured 39%, the worst in fourteen years. Use of the Program Evaluation and Review (PERT) concept of planning may eliminate this type of error. This plan utilizes computer analysis based on suitable processed climatological data by regions. "The forecast weather may not improve for the force as a whole, but the staff weather officer will have a better idea of the activities requiring the greatest amount of support and he can focus his attention to their mission."[19]

Urban warfare will provide the most difficult terrain in which to conduct war. Opportunities for wide sweeps are unlikely, and isolation by encirclement is difficult at best.[20] The negative aspects of collateral damage and protection of

civilians will drive the JTF commander to ensure he has adequate civil affairs representation on his staff.

"In the end it must be remembered terrain is the dictator of all tactical decisions; if you ignore it, you are building your house without a foundation."[21]

MOBILITY AND SUSTAINABILITY

Mobility depends to a large degree on the host nation's transportation infrastructure. Sustainability is proportionate to sealift success and port facilities. During Desert Storm, unchallenged sealift allowed successful sustainment. Sealift delivered 95% of all cargo.[22] Future JTF commanders may not have the benefit of unchallenged sealift, regional maritime superiority, or suitable port facilities.

"Good off road mobility is required to move large forces over great distances."[23] Future conflicts are likely to occur in regions with a well developed coastal infrastructure that dissolves quickly into a rudimentary road system inland.[24] Air transport and helicopter lift will ease this problem to a small degree. Forces must retain the capability to advance over adverse terrain. Host nations are not likely to be equipped to support US forces to the extent needed.

WEATHER MODIFICATION

Tremendous potential exists for peaceful use of weather modification technology to solve the problems of world hunger, economic instability, and drought. Unfortunately, in addition to

its use for peaceful purposes, weather modification has become a weapon of war.

The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques bans military usage of weather modification. In brief, this convention commits each party not to engage in military or any other hostile use of environmental modification techniques that could cause widespread, long-lasting, or severe destruction, damage, or injury to any other state which is a party. The use of ambiguous words like "long-lasting" and "widespread" is a cause for concern.

While generally categorized as a strategic weapon, weather control as a force multiplier needs future research.[25] The commander enjoys a considerable advantage if he could choose his fighting weather or disrupt enemy supply lines with torrential rainfall, as was done in Vietnam. Unfortunately, the public is against weather modification and has labeled it "Quagmires on demand."[26]

The Soviets have perfected techniques in fog dispersal and stimulation, hail stimulation, and lightning stimulation. It can be assumed that at least some of this technology has been exported, and the potential for covert use exist. The Soviet's delay in joining the international ban is testimony to the importance of weather modification. Prudent commanders should look for indications of climate modification and be ready to counter this form of warfare.

CHAPTER IV

POST WAR CONSIDERATIONS

When hostilities cease, the senior military commander is generally responsible for the well being of the belligerents until civilian control can be reinstated. If not prepared, the JTF commander could damage political relations and invite negative public opinion.

ECOCIDE

It is generally recognized that a frail ecological system sustains all life. The competition for finite resources coupled with a population explosion are often cause for war. Though military ecological damage is often insignificant in comparison with civilian industrial damage, public reaction is elevated by press coverage and concentrated devastation. Prudent JTF commanders will understand the sensitivity of this issue and prevent unjustifiable damage to ecosystems.

Indochina exemplifies sanctioned destruction of the environment. The massive bombing of Vietnam created innumerable bomb craters. Later, it was determined these craters turned into small ponds and caused variations in rainfall by serving as evaporative pools to the atmosphere. They also became breeding grounds for water hatched insects. Furthermore, the flying shrapnel associated with these craters is scattered throughout 20% of the land surface of Indochina. Thirty-nine million acres of land are littered with various metal contaminants.

The chemical defoliants used to clear jungle canopy in Vietnam not only had residual effects on U.S. forces, but introduced carcinogens into the enemy's food chain via rainfall runoff. The unprotected soil eroded at an uncontrollable rate and became a major source of water pollution. The hardest hit area was the mangrove ecosystem which is essential to fish and crustacean reproduction.

Environmental terrorism is not a new form of warfare. The ammunition has changed from salt, used during the Third Punic War to destroy Carthage in 146 B.C., to oil used during Desert Storm in 1991. If not preempted, a terrorist organization can hold cities, states, or even countries hostage. In order to avoid this scenario in the future, the JTF commander will be required by higher authorities to intercede before permanent environmental damage can be done. Total prevention is the goal, but the national authorities will most likely decide on a level of damage that is acceptable.

Most likely there will be negotiations. However, "Any regime which would preclude self-defense options in favor of environmental protection will be honored in the breach rather than the adherence."[27]

REFUGEES

Some argue that the increase in world population has caused an increase in the number of refugees which must be dealt with during war or upon war termination. Others claim that smart munitions will displace fewer nationals due to decreased

collateral damage and greater adherence to the law of armed conflict. Regardless of who is correct, public outcry is invited when extraordinary humanitarian measures are not practiced.

Refugees are a problem operational commanders will be forced to contend with. FM 90-10 assigns control of refugees to military police. "The most important principle in refugee control is reliance on the host government whenever possible. If the host government is incapable of performing this mission, U.S. forces may be requested to conduct refugee control."[28] Desert Storm has shown that the host government may not only be incapable of performing this function, but may be hostile to certain religious factions or ethnic groups within its own population.

Commanders may find themselves in charge of a JTF specifically designated to deal with refugees. One such force was formed to deal with the Kurds in Iraq. Non-Combatant Evacuation Operation commanders will likely find foreign nationals from the threatened state requesting refugee status. Current U.S. policy prohibits granting asylum on foreign soil. This policy does not prohibit assignment of refugee status.

Massive refugee movements can interfere with lines of communication. Hostile personnel may hide among refugees. JTF commanders must be prepared to prescribe restrictive measures. such as curfews and identification and pass systems, in addition to providing food and shelter. The environment will have great influence on the urgency. The American public will not tolerate

news footage of freezing or starving children. Medical manning will also be tested as a result of this mission.

CLEAN-UP

When the shooting stops, the clean-up begins. The JTF commander will be pressured to demilitarize the area as quickly as possible. A rapid withdrawal is particularly important to competitive businessmen who desire the opportunity to capitalize on the destruction caused by war. Commanders must ensure that a capable police force is in existence to maintain order upon departure of the military. Looting and rioting are common upon war termination. Immediate clarification of the use of riot control agents and rules of engagement with regard to rights of foreign nationals will be needed.

The engineering corps will be required to remove both land and sea mines. Hazardous chemicals must be properly disposed of. Uranium tipped munitions have recently gained much attention. This mission may be the least dangerous of the war but could easily be the most difficult.

CHAPTER V

CONCLUSIONS

There are no simple solutions to the problems the JTF commander can expect to face in the future. The wide range of national interests of the United States requires a wide range of military contingencies ~~which~~ that result in deployment of forces to any conceivable environment.

As in all major undertakings, planning is the key to success. The more problems that are anticipated and planned for prior to deployment, the more likely the success of an operation.

In planning future operations, JTF commanders must keep a number of environmental pitfalls in mind. Many of the weapons systems and other high tech equipment currently in use are vulnerable to atmospheric conditions and have not proven their effectiveness in adverse environments. When environmental conditions affect the ability to identify the target, fratricide becomes a concern. Furthermore, once equipment has been damaged, environmental factors can significantly impede the repair process. Advances in technology frequently bring about advanced problems. The JTF commander must explore these problems in order to plan effectively. The benefits to be gained from the ability to wage war twenty-four hours a day must be weighed against the toll around the clock warfare takes on men and equipment. In planning a level of reliance on satellite data commanders must give consideration to the fact that, depending on location and strength of the enemy forces, satellite data may not be available or may be compromised.

The most likely theater for future conflicts is in small, underdeveloped nations. The JTF commander will be required to address environmental concerns which have not played a key role in current doctrine. The low intensity conflict scenario will involve shallow water operations, uncharted terrain, and poorly developed infrastructures. These are environmental conditions

with which U.S forces are unfamiliar and not well prepared to contend. In addition forces will require protection from diseases that have been completely eradicated in the United States.

Planning cannot start when the conflict ends. The JTF commander must take into consideration the heightened demands of the pubic for protection of the environment and humane treatment of refugees.

A plan, no matter how well conceived, may be useless if its execution is flawed. Experience is a great asset in the implementation of plan objectives.

From an environmental standpoint, experience in theater will pay high dividends for deployed forces. Leaders will understand seasonal requirements, and troops will belay much of the anxiety that comes with deploying to an unknown region. Fighting ability and battlefield momentum will depend on a soldier's comfort zone. Temperature, humidity, clothing, and many other variables define the comfort zone. Expansion of one's comfort zone requires exposure to those elements and familiarity in dealing with them.

Training his forces in actual or simulated conditions will provide the JTF commander with a more diverse selection of troops from which to build his force structure. Forward deployment of forces is the preferred method of resolving this problem. Quite often, this option is denied due to political and economic constraints. Participation in training exercises within the area is the next preferred option. Limited exposure of the troops is

allowed, and equipment can be tested where it is expected to operate. The final option is an increase in the military personnel exchange programs. This option allows for gathering of detailed knowledge and gives insight to cultural and ethnic considerations as well.

Because the JTF commander may be planning an operation in an environment which he has limited exposure, accurate and consistent information will be very important. This need can best be met through formation of joint support units. The formation of joint environmental support units will enhance consistency of data. The success of Operation Overlord was partially due to General Eisenhower's willingness to trust his joint weather staff. Desert Storm commanders were dissatisfied with the amount of environmental support received, although they were supplied with products from every service and several cabinet agencies. A joint meteorological staff, which might have provided more cohesive data, was never formed. JTF commanders would be well advised to incorporate elements of the Air Weather Service and The Naval Oceanographic Command into the staff.

The commander has gained a new set of problems in the new world order. Our well defined enemy is replaced with a preponderence of unknowns. The current instability of the world will undoubtedly require U.S. presence on short notice to adverse environments. We must be ready to respond.

NOTES

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3. IBID.

4. Dwight Eisenhower, quoted in John F. Fuller, Weather and War (Scott Air Force Base, IL: Military Airlift Command, 1974), p. iii.

5. William P. Mack and Albert H. Konetzi, Command at Sea (Annapolis, MD: U.S. Naval Institute, 1982), p. 400.

6. Anderson, p. 20-17.

7. J.O. Langtry, Aspects of Leadership in a Modern Army (Canberra: Australian National University Strategic and Defense Studies Center, 1983), p. 3.

8. Bruce C. Clark, Guidelines for the Leader and the Commander (Harrisburg PA: Stackpole Books, 1973), p. 68.

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11. Hunt and Blair, eds. p. 33.

12. Joris Lok, "Infrared IFF May End Blue on Blue," Jane's Defense Weekly, 13 July 1991, p. 50.

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14. Langtry, p. 9.

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22. U.S. Dept. of Defense, Interim Report on the Conduct of the Persian Gulf Conflict, (Washington: 1991), P. 3-5.

23. Ibid., p. 7-3.

24. Ibid., p. 7-1.

25. T.L. Gatchel, "Weather: Operational Considerations on the Battlefield," Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1991, p. 20.

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27. James P. Terry, "The Environment and Laws of War: The Impact of Desert Storm," Frank Uhlig ed., Naval War College Review (Philadelphia: Naval Publication and Forms Center, 1992), p. 67.

28. Military Operations on Urban Terrain, p. 5-7.

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